DOCUMENT RESUME

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ABSTRACT

Adapted from military service training materials, this publication contains course materials for teaching roofing, both in the classroom and through practical experience. Students completing this short course will be able to use common tools for laying out, building and maintaining wood and composition shingles, roll roof coverings, and built-up roofing coverings. Shop and theory assignments are provided in the course. The materials are divided into an introductory class on safety and then four sections covering built-up roofing, composition shingle roof covering, wood shingle roof covering, and a course summarization section. The teacher's instruction guide offers information about class objectives, references, instructional materials, aids, homework assignments, tools, and materials. Criterion tests are provided where applicable. The teacher's guide contains a three-column format for teaching the material, with an outline of subject matter, and suggested teacher activity and student activity. Four job sheets are provided for students, and photos and line drawings are used where applicable. (The military-developed curriculum materials in this course package were selected by the National Center for Research in Vocational Education Military Curriculum Project, acquired, evaluated, adapted, and disseminated to the six regional Curriculum Coordination Centers and other instructional materials agencies.) (KC)

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MILITARY CURRICULUM MATERIALS

The military-developed curriculum materials in this course package were selected by the National Center for Research in Vocational Education Military Curriculum Project for dissemination to the six regional Curriculum Coordination Centers and other instructional materials agencies. The purpose of disseminating these courses was to make curriculum materials developed by the military more accessible to vocational educators in the civilian setting.

The course materials were acquired, evaluated by project staff and practitioners in the field, and prepared for dissemination. Materials which were specific to the military were deleted, copyrighted materials were either omitted or approval for their use was obtained. These course packages contain curriculum resource materials which can be adapted to support vocational instruction and curriculum development.

The National Center Mission Statement

The National Center for Research in Vocational Education's mission is to increase the ability of diverse agencies, institutions, and organizations to solve educational problems relating to individual career planning, preparation, and progression. The National Center fulfills its mission by:

- Generating knowledge through research
- Developing educational programs and products
- Evaluating individual program needs and outcomes
- Installing educational programs and products
- Operating information systems and services
- Conducting leadership development and training programs

FOR FURTHER INFORMATION ABOUT
Military Curriculum Materials
WRITE OR CALL

Program Information Office
The National Center for Research in Vocational Education
The Ohio State University
1960 Kenny Road, Columbus, Ohio 43210
Telephone: 614/486-3655 or Toll Free 800/848-4815 within the continental U.S. (except Ohio)

THE NATIONAL CENTER FOR RESEARCH IN VOCATIONAL EDUCATION
The Ohio State University · 1960 Kenny Road · Columbus, Ohio 43210
Tel (614) 486-3655
Cable: CTVOCEDOSU/Columbus, Ohio

Military Curriculum Materials for Vocational and Technical Education

Information and Field Services Division

The National Center for Research in Vocational Education

Military Curriculum Materials Dissemination Is . . .

an activity to increase the accessibility of military-developed curriculum materials to vocational and technical educators.

This project, funded by the U.S. Office of Education, includes the identification and acquisition of curriculum materials in print form from the Coast Guard, Air Force, Army, Marine Corps and Navy.

Access to military curriculum materials is provided through a "Joint Memorandum of Understanding" between the U.S. Office of Education and the Department of Defense.

The acquired materials are reviewed by staff and subject matter specialists, and courses deemed applicable to vocational and technical education are selected for dissemination.

The National Center for Research in Vocational Education is the U.S. Office of Education's designated representative to acquire the materials and conduct the project activities.

Project Staff:

Wesley E. Budke, Ph.D., Director
National Center Clearinghouse

Shirley A. Chase, Ph.D.
Project Director

What Materials Are Available?

One hundred twenty courses on microfiche (thirteen in paper form) and descriptions of each have been provided to the vocational Curriculum Coordination Centers and other instructional materials agencies for dissemination.

Course materials include programmed instruction, curriculum outlines, instructor guides, student workbooks and technical manuals.

The 120 courses represent the following sixteen vocational subject areas:

- Agriculture
- Aviation
- Building & Construction Trades
- Clerical Occupations
- Communications
- Drafting
- Electronics
- Engine Mechanics
- Food Service
- Health
- Heating & Air Conditioning
- Machine Shop
- Management & Supervision
- Meteorology & Navigation
- Photography
- Public Service

The number of courses and the subject areas represented will expand as additional materials with application to vocational and technical education are identified and selected for dissemination.

How Can These Materials Be Obtained?

Contact the Curriculum Coordination Center in your region for information on obtaining materials (e.g., availability and cost). They will respond to your request directly or refer you to an instructional materials agency closer to you.

CURRICULUM COORDINATION CENTERS

EAST CENTRAL
Rebecca S. Douglass
Director
100 North First Street
Springfield, IL 62777
217/782-0759

NORTHWEST
William Daniels
Director
Building 17
Airdustrial Park
Olympia, WA 98504
206/753-0879

MIDWEST
Robert Patton
Director
1515 West Sixth Ave.
Stillwater, OK 74704
405/377-2000

SOUTHEAST
James F. Shill, Ph.D.
Director
Mississippi State University
Drawer DX
Mississippi State, MS 39762
601/325-2510

NORTHEAST
Joseph F. Kelly, Ph.D.
Director
225 West State Street
Trenton, NJ 08625
609/292-6562

WESTERN
Lawrence F. H. Zane, Ph.D.
Director
1776 University Ave.
Honolulu, HI 96822
808/948-7834

Developed by

United States Navy

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840.884

Occupational Area:
Building and Construction

Target Audiences:

Grades 10-adult

Print Pages:

86

Cost:

$2.00

Availability:
Military Curriculum Project, The Center for Vocational Education, 1960 Kenny Rd., Columbus, OH 43210

Contents:	Type of Materials: Lesson Plans:	Programmed Text:	Student Workbook:	Handouts:	Text Materials:	Audio-Visuals:	Instructional Design: Performance Objectives:	Tests:	Review Exercises:	Additional Materials Required:	Type of Instruction: Group Instruction:	Individualized:	
Unit 1.1 – **Introduction**													
1.1.2 Safety	•					★	•				•		
Unit 1.2 – **Roofing**													
1.2.1 Built-Up Roofing	•			•	•	★	•	•		★	•	•	
1.2.2 Composition Shingle Roof Covering	•			•	•		•	•		★	•	•	
1.2.3 Wood Shingle Roof Covering	•			•			•	•		★	•	•	
1.2.4 Course Summarization	•				•		•	•		★	•	•	

★ Materials are recommended but not provided.

Course Description

Students completing this short course will be able to use common tools for laying out, building and maintaining wood and composition shingles, roll roof coverings, and built-up roofing coverings. Shop and theory assignments are provided in this course. The course materials are divided into two units. The first section of the first unit is not suitable for vocational programs. This section deals with military chain of command and reporting procedures. The remaining sections are suitable.

Unit 1.1 – **Introduction** contains a thirty minute class on safety. No shop time is required.

Unit 1.2 – **Roofing** contains the following four sections covering 22 hours of class and shop time:

1.2.1 Built-up Roofing (3 hours class instruction, 7 hours shop)
1.2.2 Composition Shingle Roof Covering (2 hours class instruction, 5 hours shop)
1.2.3 Wood Shingle Roof Covering (2 hours class instruction)
1.2.4 Course Summarization (1 hour class instruction, 2 hours shop)

The teacher's instruction guide offers information about class objectives, references, instructional materials, aids, homework assignments, tools and materials. Criterion tests are provided where applicable. To help the students, four job sheets are provided. The text recommended is *Builder 3 & 2, NAVPERS 10648-F*. The required pages, 348-354, are provided. Four commercially produced books and several practical samples are suggested for use but are not provided. The following two training films are also recommended but are not provided:

GIF-001	The Gift of Life (18 min.)
NP-DAN-002	Danger-Roofers at Work

THE CENTER FOR VOCATIONAL EDUCATION

BUILDERS SCHOOL, ROOFING

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SPECIAL CONSTRUCTION BATTALION TRAINING

BUILDERS SCHOOL
162.1 ROOFING

3-14

JANUARY 1976

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HOW TO USE INSTRUCTOR GUIDES

Instructor Guides are provided for each topic and include supporting instructional materials and aids identified by the topic number and preceded by a letter code designation. The letter code key is as follows:

AS - Assignment Sheet
JS - Job Sheet
IS - Information Sheet
CN - Class Notes
OS - Operation Sheet
T - Test
FT - Final Test
TR - Transparency
DS - Diagram Sheet
PS - Problem Sheet
PT - Pretest
PE - Performance Evaluation
WS - Work Sheet
G - General (give a definition of item)

A complete listing of all supporting materials and aids is documented with full descriptive titles in Annex.

The instructor guides are intended to be used as master lesson plans subject to personalization by the individual instructor. In all cases, it is expected that the instructor will study the references in preparation for annotating the guide. It is also expected that each instructor will develop an appropriate introduction for each topic that will (1) create interest, (2) show the value of the topic to the student, (3) relate the topic to previous and future topics in the course, and (4) communicate the learning objectives to the student. Well prepared introduction will then provide the important motivational conditioning to establish readiness and effect for learning appropriate to each topic.

The first page of each instructor guide contains the following functional information:

1. Topic of lesson.
2. Time in periods.
3. References.
4. Instructional Materials.
5. Instruction Aids.
6. Objectives (Terminal and Enabling).
7. Topic criterion test (as applicable).
8. Homework assignment (when applicable).
9. Tools and materials.

The pages following page 1 of each instructor guide provide in a three-column format the teaching/learning procedures for conducting the lesson. The left hand column includes the outline of instructional content required by the objectives; the center column includes recommended instructor activities or methodology; the center column contains recommended student learning activities.

While the methodology and student learning activities documented in each instructor guide have been tested and proven to be effective for the lead school, those schools implementing this curriculum are encouraged to exercise creativity in designing learning exercises and conceiving methods and techniques to meet course objectives.

OUTLINE OF INSTRUCTION

TOPIC	Unit 1.1	CLASS	PRACT	TOTAL	PAGE
	Orientation and Safety				
1.1.1	Orientation	1.5	0	1.5	3
1.1.2	Safety	0.5	0	0.5	3
		2	0	2	
	Unit 1.2				
	Roofing				
1.2.1	Built-up Roofing	3	7	10	3
1.2.2	Composition Shingle Roof Covering	2	5	7	3
1.2.3	Wood Shingle Roof Covering	2	0	2	4
1.2.4	Course Summarization	1	2	3	4
		8	14	22	

* Total periods classroom: 10
* Total periods practical: 14
Total hours for course: 24
Total weeks for course: 0.8 week

* Each period of instruction represents 60 minutes of actual instruction.

OUTLINE OF TRAINING OBJECTIVES

Unit 1.1 Introduction — Contact Hours: 2

Terminal Objectives: Upon completion of this unit the student will have reported to Builder School, received the school orientation and safety procedures required to complete the assigned course of instruction as a SCBT student.

Topic 1.1.1 ORIENTATION — Contact Hours: 1.5

Enabling Objectives: Upon completion of this topic the student will have reported for the course and answered questions pertaining to key points on the organization, mission and regulations of NAVCONSTRACEN.

Topic 1.1.2 SAFETY — Contact Hours: 0.5

Enabling Objectives: Upon completion of this topic the student will be able to report accidents or fire, and state the safety program that will be enforced in the school.

Unit 1.2 ROOFING — Contact Hours: 22

Terminal Objectives: Upon completion of this unit the student will have met all of the requirements of Personnel Readiness Capability Program skill level 162.1 (roofing) involving wood and composition shingles, roll roof coverings and built-up roofing coverings. The installed roof coverings will be accomplished by following job sheet procedures and will meet all the specifications as stated on the job sheet.

Topic 1.2.1 BUILT-UP ROOFING — Contact Hours: 10

Enabling Objectives: Upon completion of this topic the student will be able to use common built-up roofing tools in laying out, preparing and applying hot built-up roofing materials; operating and performing operator's maintenance of a tar kettle by following procedures as outlined in Job Sheets SCBT 162.1 BU JS 1.2.1.1, "Operating a Tar Kettle", and SCBT 162.1 BU JS 1.2.1.2, "Built-up Roofing Application". In operating the tar kettle, the air pressure gauge on the tar kettle will register within 30 to 60 pounds and the thermostat will be set within 400 degrees to 500 degrees F., for asphalt and 250 degrees to 350 degrees F., for pitch. The completed built-up roofing project will have 4 pieces of roofing felt in all 3 cone samples taken from the roof. Job sheets will be provided to the student.

Topic 1.2.2 COMPOSITION SHINGLE ROOF COVERING Contact Hours: 7

Enabling Objectives: Upon completion of this topic the student will be able to use common composition shingling tools in laying out, preparing and applying composition shingles and valley flashings to an intersecting roof by following procedures in accordance with Job Sheet SCBT 162.1 BU JS 1.2.2.1, "Laying Composition Shingles". The completed composition shingled roof will have the valley flashing laid in the valley of the roof without kinks, the valley shingle space opening will be straight and within 5 1/2 to 6 1/2 inches wide, nails will not be driven in the valley flashing within the smaller edge crimp, and all shingle will be laid to within $\pm$ 1/8" off 5" weather exposure.

Topic 1.2.3 WOOD SHINGLE ROOF COVERING Contact Hours: 2

Enabling Objectives: Upon completion of this topic the student , as a class member, will be able to orally answer key questions pertaining to laying out, preparing and applying wood shingle covering on a roof. All answers must be compatable with Information Sheet SCBT 162.1 BU IS 1.2.3.1, "Laying Wood Shingles". The student will be provided with required information sheets.

Topic 1.2.4 COURSE SUMMARIZATION Contact Hours: 3

Enabling Objectives: Upon completion of this topic the student will have reviewed the methods used in the application of the various roof coverings as the coverings are being removed. All salvagable roofing materials will be clear of nails and will be neatly stacked.

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ANNEX I

TEXTS:

1. Builder 3 & 2, NAVPERS 10648-F

ANNEX II

REFERENCES:

1. Fundamentals of Carpentry, Volume 2, W.E. Durbahn/E.W. Sandberg
American Technical Society

2. Interior and Exterior Trim
Delmar Publishers

3. Manufacture, Selection and Application of Asphalt Roofing and Siding Products
J.L. Straham, Eleventh Edition
Asphalt Roofing Manufacturer's Association

4. Operation and Maintenance Instruction Berry Corporation

5. Roofing and Sheetmetal Work NAVFAC specifications 7Y.

ANNEX III

TOOLS, EQUIPMENT AND MATERIALS:

TOOLS:

1.	5210-00-293-3505	Measuring tape, 10 ft.	16 ea.	.94
2.	5120-00-892-5485	Hammer, carpenter, 16 oz.	8 ea.	3.60
3.	5210-00-273-9793	Chalkline and Reel.	3 ea.	.83
4.		Knife, linoleum	4 ea.	1.08
5.		Snip, tin		
6.		Axe		
7.		Hatchet, shingling	1 ea.	11.00
8.		Twine		
9.	70L-4020-00-587-0994	Cord, nylon twisted 350 ft.	1 ea	1.50
10.	9QG-5110-00-221-1083	Shear, Metal strt. 16		5.36
		Mop, roofing		

EQUIPMENT:

1.	8415-00-205-3895	Apron, carpenter nail	1 ea.	2.50
2.		Glue		
3.		Tar kettle (55 gallons)		
4.		Buckets (5 gallon)		

ANNEX III

MATERIALS:

1. Composition Shingle - 3 tabs
2. Wood Shingle, 16", 2 1/2 to the butt
3. Felt, asphalt, 15#
4. Building paper
5. Flashing, valley
6. Asphalt, roofing
7. Nails, roofing, 7/8"
8. Nails, 3d, box, galvanized or blued
9. Kerosene
10. 1" (full) x 2" strips of wood.
11. 3/8" X 2" strips of wood.

ANNEX IV

TRAINING AIDS

FILMS

1. GIF-001 The Gift of Life
2. NP-DAN-002 Danger - Roofers at Work

SAMPLES

1. Roofing felt
2. Roofing nails
3. Building paper
4. Roofing asphalt
5. Valley flashing
6. Composition Shingle
7. Composition capping
8. Wood shingles
9. Shingle nails, 3d, box, galvanized or blued

MOCK UP

1. Application sequence of built-up roofing materials.
2. Application sequence of composition shingle - starter course and starter shingles.
3. Application sequence of wood shingle - starter course

ANNEX IV

TRAINING AIDS AND DEVICES

1. Flock cards

   a. Built-up Roofing Forms.

2. Locally Prepared Materials.

   a. Job sheets.

      (1) SCBT 162.1 BU JS 1.2.1.1, "Operating a Tar Kettle".

      (2) SCBT 162.1 BU JS 1.2.1.2, "Built-up Roofing".

      (3) SCBT 162.1 BU JS 1.2.2.1, "Laying Composition Shingles".

   b. Information sheets.

      (1) SCBT 162.1 BU IS 1.2.3.1, "Laying Wood Shingles".

3. Samples.

   1. 3/4" x 2" guide strip of wood.

   2. 1" (full) x 2" guide strips of wood.

ANNEX V

TRAINING AIDS EQUIPMENT

Projector:

1. 16 MM Projector

2. Flock card board.

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ANNEX VI

MASTER SCHEDULE

SCBT - 162.1 ROOFING

FIRST WEEK

TOPIC NO.	TYPE	PERIOD	TITLE	RATIO
FIRST DAY				
1.1.1	C	1	Orientation	16/1
		2		
1.1.2	C	2.5	Safety	16/1
1.2.1	C	3	Built-up Roofing	16/1
		4		
		5		
1.2.2	C	6	Composition Shingle Roof Covering	16/1
		7		
SECOND DAY				
1.2.1	P	8	Built-up Roofing	8/1
		9		
		10		
		11		
		12		
		13		
		14		
THIRD DAY				
1.2.2	P	15	Composition Shingle Roof Covering	8/1
		16		
		17		
		18		
		19		
1.2.3	C	20	Wood Shingle Roof Covering	16/1
		21		
FOURTH DAY				
1.2.4	C	22	Course Summarization	16/1
		23		
		24		

MODIFICATIONS

Instructor Guide 1.1.1 of this publication has (have) been deleted in adapting this material for inclusion in the "Trial Implementation of a Model System to Provide Military Curriculum Materials for Use in Vocational and Technical Education." Deleted material involves extensive use of military forms, procedures, systems, etc. and was not considered appropriate for use in vocational and technical education.

SCBT-100 - 190-BU-IG-1.1.2

NAVAL CONSTRUCTION TRAINING CENTER
PORT HUENEME, CALIFORNIA 93043
SPECIAL CONSTRUCTION BATTALION TRAINING COURSE (SCBT) 100 - 190

Classification: Unclassified

Topic: Safety

Average Time: 0.5 Periods (Class)

Instructional Materials:

A. Texts: None.

B. References.

1. NAVCONSTRACENINST. 5400.4, (current series) "Organization Manual of NAVCONSTRACEN."

2. "Safety Practices for Shore Activities," NAVMAT P-5100, (Jan 1973).

C. Tools and Equipment: None.

D. Training Aids and Devices.

1. Film.

a. GIF-001, "The Gift of Life," (18 min.)

E. Training Aids Equipment.

1. 16mm Movie Projector.

Terminal Objective: Upon completion of this unit the student will have reported to Builder School, received the school orientation and safety procedures required to complete the assigned course of instruction as a SCBT student.

Enabling Objectives: Upon completion of this topic the student will be able to report accidents or fire, and state the safety practices that will be enforced in the school.

Criterion Test: The student will answer orally specific question pertaining to the method of reporting and fighting fires as established by NAVCONSTRACEN and CBC regulations, and will conform to the safety policies for the duration of his assignment to Builder School.

Homework: None.

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
I. Introduction to the Lesson:		
A. Establish contact.	I.A. Introduce self and topic.	
1. Name:		
2. Topic: Safety.		
B. Establish readiness.	I.B. Motivate student.	
1. Purpose.		
2. Assignment.		
C. Establish effect.	I.C. Bring out need and value of material being presented.	
1. Value.		
a. Pass course.		
b. Perform better on the job.		
D. Overview.	I.D. State learning objectives.	
1. You will be able to answer orally specific questions related to the methods of reporting and fighting fires as established by NAVCONSTRACEN and CBC regulations and conform to the safety practices that will be enforced in this school.	1. State information and materials necessary to guide student.	
2. Ask questions.		
3. Take notes.		

OUTINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
II. Presentation:		
A. Safety.		
1. Reporting accidents.		
a. Class safety man.	1.a. Pick safety mand and explain job.	
b. Instructor.		
c. School director.		
d. First aid when appropriate.		
2. Fire safety.		
a. Evacuation routes.		
b. Reporting fires.		
c. Fighting fire.		
(1) Location of extinguishers.		
3. Field safety.	A.3. Introduce film.	
a. Show film: GIF-001, "The Gift of Life."	a. Discuss key points to look for.	
	b. Show film.	
b. Discuss film highlights.	3.b. Lead discussion.	3.b. Participate in discussion - ask questions as necessary.
	1. Ask questions.	
	2. Stress safety.	

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
III. Application:		
A. Discussion.	III.A. Questions to be developed by the instructor.	III.A. Answer and ask questions.
IV. Summary:		
A. Safety.		
1. Reporting accidents.		
2. Fire safety.		
3. Field safety.		
V. Test:		
A. None.		

NAVAL CONSTRUCTION TRAINING CENTER
PORT HUENEME, CALIFORNIA 93043
SPECIAL CONSTRUCTION BATTALION TRAINING (SCBT) 162.1

Classification: Unclassified

Topic: Built-Up Roofing

Average Time: 3 Periods (Class) 7 Periods (Pract)

Instructional Materials:

A. Text.

1. Builder 3 & 2, NAVPERS 10648-F, Chapter 12, pp. 348 - 354.

B. References:

1. Manufacture, Selection and Application of Asphalt Roofing and Siding Product, J.L. Straham, Eleventh Edition Asphalt Roofing Manufacturers Association 757 Third Avenue, New York, N.Y.

2. Operation and Maintenance Instruction, Berry Corporation.

3. Roofing and Sheetmetal Work, NAVFAC Specification 7Y.

C. Tools, Equipment and Materials:

1. Tools.

a. Measuring tape.

Terminal Objectives: Upon completion of this unit the student will have met all of the requirements of Personnel Readiness Capability Program skill level 162.1 (roofing) involving wood and composition shingles roll roof coverings and built-up roofing coverings. The installed roof coverings will be accomplished by following job sheet procedures and will meet all the specifications as stated on the job sheet.

Enabling Objectives: Upon completion of this topic the student will be able to use common built-up roofing too in laying out, preparing and applying hot built-up roof ing materials; operating and performing operator's main tenance of a tar kettle by following procedures as outlined in Job Sheets SCBT 162.1 BU JS 1.2.1.1, "Operatin a Tar Kettle", and SCBT 162.1 BU JS 1.2.1.2, "Built-Up Roofing Application". In operating the tar kettle, the air pressure gauge on the tar kettle will register with 30 to 60 pounds and the thermostat will be set within 400 degrees to 500 degeees F., for asphalt and 250 degr to 350 degrees F., for pitch. The completed built-up roofing project will have 4 pieces of roofing felt in a 3 cone samples taken from the roof. Job sheets will be provided to the student.

Criterion Test: The student will work as a team member in completing a built-up roofing project which will have at least 4 pieces of roofing felt in any area of the roof.

b. Roofing mop.

c. Linoleum knife.

d. Axe.

e. Tar kettle (55 gallons).

f. Gloves.

g. Roofing felt.

h. Roofing nails.

i. Roofing asphalt.

j. Building paper.

k. Kerosene.

D. Training Aids and Devices:

1. Film.

   a. NP-DAB-002, "Danger - Roofers at Work".

2. Mock-up showing application sequence of built-up roofing materials.

3. Flock cards on built-up roofing terms.

4. Samples of roofing materials.

5. Locally Prepared Materials.

   a. Job sheets.

Homework: Read:

1. Builder 3 & 2, page 348-354.

(1) SCBT 162.1 BU JS 1.2.1.1,
"Operating a Tar Kettle".

(2) SCBT 162.1 BU JS 1.2.1.2,
"Built-up Roofing Application".

E. Training Aids Equipment:

1. 16mm movie projector.

2. Flock card board.

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
I. Introduction to the lesson		
A. Establish contact.		
1. Name	I.A.1 Introduce self	
2. Topic: Built-up Roofing	I.A.2 Introduce topic	
B. Establish readiness		
1. Built-up roofing is used extensively in construction battalion as roof covering It will be to your advantage to learn this task. Built-up roofing is used when the slope of the roof ranges from nearly flat to 4 inch rise to a foot.	I.B.1 Motivate student by reading the statement on built-up roofing.	
2. Assignment		
a. Read:		
(1) Builder 3&2, pages 348-354		
C. Establish effect		
1. Value		
a. Pass course		
b. Perform better on the job		
c. Get advanced		
d. Be a better Builder		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
D. Overview	I.D. State learning Objectives.	
1. Job sheet - to help you follow instruction being given and to help you in the final exercise.	1. Upon completion of this topic you will be able to lay out and prepare roofing materials for application, operate a tar kettle and apply hot built-up roofing materials.	
2. Pay close attention to demonstration by the instructor.		
3. Ask questions.		
4. Stress safety.		
II. Presentation		
A. Introduce job sheets.	II.A. Hand out job sheets.	
1. SCBT 162.1 BU JS 1.2.1.1, "Operating a Tar Kettle".		
2. SCBT 162.1 BU JS 1.2.1.2, "Built-up Roofing Application".		
B. Built-up roofing terms and materials.	II.B. Give a brief lecture on terms and materials.	
1. Ply-one thickness of roofing material.		
2. Square - Area 10 ft. x 10 ft. or 100 sq.ft.		
3. Weight - Weight per square of roofing materials.		
4. Felt -	II.B.4. Give a brief lecture on roofing materials - show roofing materials samples to reinforce lecture.	
a. Tar paper 15 to 90 pounds per square.		

OUTLINE OF INSTRUCTION | INSTRUCTOR ACTIVITY | STUDENT ACTIVITY

5. Blotter

   a. Building paper.

      (1) Kraft.

      (2) Rosin.

      (3) Sisal kraft.

6. Vapor barrier.

   a. Usually 15 lb. felt.

   b. To prevent water from reaching blotter and roof sheathing.

7. Binder.

   a. Pitch.

   b. Asphalt.

   NOTE: In temperature of 40° F., and below, hot ply roofing should not be applied.

8. Flashing.

   a. Gravel stop.

   b. Drip plate.

9. Flood coat.

   a. Covering to seal roof.

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
10. Glaze coat.		
a. Hot binder mopped over roof to insure water tightness in between job stops.		
11. Gravel - cools the roof and prolongs sudden change in temperature.		
C. Film.		
1. Introduce film.	II.C.1. Introduce film	
a. NP-DAN-002, "Danger - Roofers at Work".		
2. Discuss key points to look for in the film.	II.C.2. In discussing key points, stress safety.	
3. Show film.	II.C.3. Show film.	
4. Discuss film highlights.	II.C.4. Lead discussion.	II.C.4. Participate in discussion.
a. Ask questions.	a. Point out highlights. b. Stress safety.	
D. Procedures.		
1. Roof preparation.	II.D.1. Give lecture on preparation.	
a. Clean.		
b. Fill cracks and cover knot holes.		
c. Assure sheathing is nailed solidly.		

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OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
2. Built-up roofing application. a. Blotter. (1) Start at the downhill eave of the roof, flush with the edge. (2) Spot nail to hold paper in place. (3) Lay 2nd sheet, overlapping the first sheet 2 inches, and spot nail 4 inches on end lap. (4) In like manner lay blotter over entire roof. 3. Apply upper barrier. a. Start at downhill eave of roof. (1) Measure up 30" at each end and snap a chalkline through the points. (2) Lay and secure 15 lb. felt to the chalkline with 6" overhang at each end. (3) Lay vapor barrier with 2" side lap and 4" end lap to cover entire roof.	II.D.2. Give lecture on the application of built-up roofing to reinforce lecture. a. Call student attention to Job Sheet SCBT 162.1 BU JS 1.2.1.2. b. Use mock up on built-up roofing.	

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OUTLINE OF INSTRUCTION | INSTRUCTOR ACTIVITY | STUDENT ACTIVITY

4. Lay the first hot ply (felt).

   a. Cut a strip 12" wide.

   b. Lay out this strip flush with the edge of the roof.

   c. Roll up each end to the center.

   d. Starting at the roll of felt, mop hot tar on the roof, unroll the strip of felt on the tar and keeping the felt flush with the edge of the roof.

   e. Smooth out the felt and remove air bubbles with the use of a broom.

5. Lay the second hot ply.

   a. Lay the 24" wide strip following procedures as in laying of the first hot ply.

6. Lay the third hot ply.

   a. Lay a full sheet, following procedures outlined in step 5, cover entire roof.

   b. End up in reverse sequence.

      (1) 2/3 sheet.

      (2) 1/2 sheet.

OUTLINE OF INSTRUCTION | INSTRUCTOR ACTIVITY | STUDENT ACTIVITY

7. Felt envelope.

   a. Fold 6" overhang unto top of roof and flush with the edges.

   b. Hot mop to hold in place.

8. Apply flashing (gravel stop)

   a. Nail at 6" on center.

   b. No breaks on corner.

   c. Overlap 4" on all joints.

9. Apply 8" strip over flashing nails.

   a. 3/4" from gravel.

   b. Hot mop in place.

10. Apply 10" strip over 8" strip.

    a. 3/4" from gravel stop.

    b. Hot mop in place.

11. Apply flood coat.

    a. To completely seal roof covering

12. Apply roof surface gravel.

    a. Must be applied to hot surface.

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OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
13. Operating a tar kettle. a. Fill tank with fuel. (1) Close all valves. (2) Remove filler cap. (3) Fill tank 3/4 full. (4) Replace filler cap.	II.D.13. Take the class out to the field and give lecture/demonstration in the operating of the tar kettle. Call student attention to Job Sheet SCBT 162.1 BU JS 1.2.1.2.	II.D.13. Turn to Job sheet and follow instruction/demonstration being given.

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY

b. Pump tank with air

(1) Unlatch pump handle.

(2) Pump air until air gage registers 30-60 pounds pressure.

(3) Latch pump handle.

(4) Air compressor may be used if tank is properly equipped.

c. Generator burner(s)

(1) Place burners on ground.

(2) Check hose for leaks.

(3) Open strainer valve 1/2 turn.

(4) Fill pan under generator with 1/4" of fuel above bottom of pan.

(5) Close strainer valve.

(6) Light wick.

(7) Allow burner to heat until kerosene turns into a white vapor.

(8) Open strainer valve 1/4 turn.

(9) Allow burner to heat until a forceful yellow-blue flame is acquired.

(a) If flooding occurs, close valve and try again.

OUTLINE OF INSTRUCTION | INSTRUCTOR ACTIVITY | STUDENT ACTIVITY

d. Heat the transfer oil in oil jacket surrounding the tar kettle.

(1) Place burner in rack provided under chain drive.

(2) Maintain oil at desired temperature.

(a) Do not exceed 550 degree F. Flash point of transfer oil is 600 degrees F.

e. Adjust thermostat control for low fire and full flame.

(1) Set thermostat at 450 degrees F after burner is burning steadily and oil temperature is above 150 degrees F.

(2) Remove by-pass plug.

(3) Open needle valve 2 or 3 turns on fuel by-pass.

(4) Close thermostat setting knob to 350 degrees F.

(5) Slowly close needle valve until burner maintains a smooth even flame.

(6) Replace by-pass plug.

(7) Reset thermostat at 450 degrees F.

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OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
f. Fill bucket with asphalt.		
(1) Place bucket under spigot.		
(2) Open spigot.		
(3) Fill bucket 3/4 full.		
(4) Close spigot.		
III. Application.		
A. Student practice.	III.A. Assign student to their job-rotate such that the students are exposed to all phases of roofing.	III.A. Student work a a team member in the o erating of the tar ket and in the application built-up roofing.
1. Two student to the kettle.		
2. Three students to carry the buckets.		
3. Other students on roof, practicing applying built-up roofing.		
IV. Summary.		
A. Built-up roofing terms and materials.		
1. Ply.		
2. Square. -(100 square feet).		
3. Weight.		
4. Felt.		
5. Binder.		
6. Vapor barrier		

OUTLINE OF INSTRUCTION | INSTRUCTOR ACTIVITY | STUDENT ACTIVITY

a. Kraft.

b. Rosin.

c. Sisal kraft.

7. Flashing.

8. Flood coat.

9. Glaze coat.

10. Gravel.

B. Built-up roofing application.

1. Apply blotter.

2. Apply vaopr barrier.

3. Lay hot ply.

C. Operating the tar kettle.

1. Fill tank with fuel.

2. Pump tank with air.

3. Generate burner.

4. Heat transfer oil.

5. Adjust thermostat.

V. Test.

A. Student will perform criterion test as stated. (15 of 15)

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NAVAL CONSTRUCTION TRAINING CENTER
PORT HUENEME, CALIFORNIA 93043
SPECIAL CONSTRUCTION BATTALION TRAINING (SCBT) 162.1
JOB SHEET

Title: Operating a Tar Kettle

Introduction: This job sheet is to guide you in operating a tar kettle.

Tools and Equipment:

1. Axe
2. Gloves
3. Buckets, 5 (gallon)
4. Tar kettle (55 gal.)

Materials:

1. Kerosene.
2. Roofing asphalt.

Procedure:

1. Fill tank with fuel.
   a. Close all fuel valves and trip relief valve at the top of fuel tank to release any pressure left in fuel tank.
   b. Remove filler cap and fill tank 3/4 full with good clean kerosene.
      (1) Kerosene <u>not</u> gasoline.
   c. Replace filler cap, hand tighten only.
2. Pump tank with air.
   a. Unlatch pump handle and pump air until the air gauge registers 30 to 60 pounds of pressure.
   b. Latch pump handle after desired air pressure is acquired.
   c. Use of air compressor is permissable if tank is equipped with proper fittings.
      (1) In using air compressor, precautions should be taken not to exceed allowable pressure.

3. Generate burners. Both burners are used for fast warm-up

   a. Place burners on the ground with the flame end pointing away from any inflammable object.

   b. Check hose for leaks.

   c. Assure that all hose connections are tight.

   d. Open valve on fuel tank allowing fuel to fill hose.

   e. Open strainer valve on burner 1/2 turn.

   f. Place fingers in front of jet to deflect fuel into pan under the generator coil until 1/4" of pan bottom is covered.

   g. Close strainer valve.

   h. Light wick with match.

      (1) If wick is lost, use a small piece of paper or rag in pan to light.

   i. Allow burner to heat until kerosene changes into a white vapor. This process usually takes about five (5) minutes.

   j. Open strainer valve 1/4 turn as the burner starts to produce flame.

   k. Allow burner to heat several minutes then slowly open strainer valve until a forceful yellow-blue flame is acquired.

      (1) This is to prevent flooding. Flooding will produce a large red flame.

   l. If flooding occurs, close valve and repeat step three.

4. Heat the transfer oil in oil jacket surrounding the tar kettle.

   a. Place burner in rack provided under chain drive in such a way that all the flame be in the fire box.

   b. Maintain oil temperature at whatever is necessary to get desired material temperature.

      (1) Do not exceed 550 degrees F. The transfer oil has a flash point of 600 degrees F.

5. Adjust thermostat control for low fire and full flame.

   a. Set thermostat at 450 degrees after burner is burning steadily and oil temperature is above 150 degrees F.

      (1) 400 degrees F. setting is for asphalt and 325 degrees F. is for pitch.

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b. Remove by-pass plug (set screw on top of thermostat).

c. Using a small screwdriver, open needle valve on fuel by-pass two or three turns.

d. Close thermostat setting knob to minimum temperature of 350° F.

(1) Minimum temperature of 325° F., for pitch.

e. Slowly close the needle valve until burner maintains a smooth even flame.

(1) This adjusting may require five (5) to ten (10) minutes.

f. Replace the by-pass plug.

g. Reset thermostat to 450° F., bringing the burner to full flame.

(1) Burner will remain at full flame until oil temperature reaches thermostat setting and will throttle to maintain at desired temperature.

6. Fill bucket with asphalt.

a. Place bucket under discharge spigot.

b. Open spigot.

c. Fill bucket 3/4 full.

d. Close spigot.

7. Check work with the instructor.

a. The air pressure gauge must register within 30 to 60 pounds and the thermostat set within 400° to 500° F., for asphalt and 250° to 350° F., for pitch.

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NAVAL CONSTRUCTION TRAINING CENTER
PORT HUENEME, CALIFORNIA 93043
SPECIAL CONSTRUCTION BATTALION TRAINING (SCBT) 162.1
JOB SHEET

Title: Built up Roofing Application

Introduction: This job sheet is to guide you in the project of applying built-up roofing.

References:

1. Builder 3 & 2, NAVPERS 10648-F, Chapter 12, pages 352 & 353.

Tools and Equipment:

1. Tar kettle
2. Roofing mop
3. Broom
4. Linoleum knife
5. Measuring tape
6. Hammer

Materials:

1. Roofing felt
2. Roofing nails
3. Roofing asphalt
4. Building paper

Procedures:

1. Apply the first layer of roofing felt.
   a. Starting at the eave of the roof, lay the first sheet of felt flush with the edge and without any kinks.
      (1) This procedure allows overlap to be in the direction of water shed.
   b. Spot nail just enough to hold the paper in place.
   c. Roll out the second sheet overlapping the first by 2 inches and spot nail as before.
   d. Continue this procedure until entire roof is covered.

2. Lay the first hot ply.

   a. From a full sheet of felt, cut a strip 1/3 the width of the sheet, approximately 12 inches wide and save the remaining 2/3 of a sheet.

   b. Layout the 12 inch wide strip with one edge flush with the edge of the roof.

   c. Roll up each end of this strip toward the center.

   d. Starting at the roll of felt, mop hot tar on the roof unrolling the strip of felt into the tar keeping the felt flush with the edge of the roof.

      (1) Mop man must insure that the tar being applied is between 300 degrees F to 425 degrees F. Ideal temperature being 375 degrees F.

   e. Use a broom to smooth out the felt and remove air bubbles.

3. Lay the second hot ply.

   a. Use the remaining piece of felt from which the first strip was cut and lay it out following the procedure outlined in steps 2b, 2c, 2d and 2e.

      (1) Insure that the proper temperature is maintained when applying tar.

4. Lay the third and remaining hot plys.

   a. Use a full width (36") strip of felt and lay it out following the procedures outlined in steps 2c, 2d and 2e.

   b. The next strip to be laid is rolled out with its edge 12 inches from the edge of the roof and is applied following the procedure outlined in steps 2c, 2d and 2e.

   c. Continue laying strips following the procedures outlined in steps 2c, 2d and 2e until the entire roof is covered. Each strip will be laid 12 inches from the edge of the previously laid strip. (See illustration on page 3).

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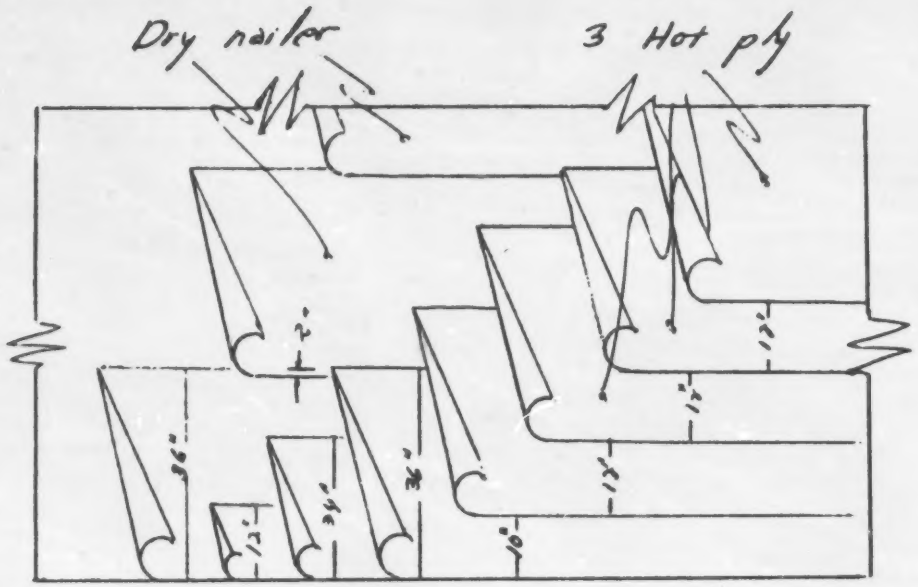

5. Check with the instructor.

NAVAL CONSTRUCTION TRAINING CENTER
PORT HUENEME, CLAIFORNIA 93043
SPECIAL CONSTRUCTION BATTALION TRAINING (SCBT) 162.1

Classification: Unclassified

Topic: Composition Shingle Roof Covering

Average Time: 2 Period (Class) 5 Period (Pract)

Instructional Materials:

A. Text:

1. Builder 3 & 2, VAVPERS 10648-F, Chapter 12, pages 348-352.

B. References:

1. Manufacture, Selection and Application of Asphalt Roofing and Siding Product
J.L. Straham, Eleventh Edition
Asphalt Roofing Manufactures Association
757 Third Avenue, New York, N.Y. 10017

C. Tools, Equipment and Materials

1. Tools.

a. Measuring tape.

b. Linoleum knife.

c. Shingling hatchet.

d. Nail apron.

Terminal Objectives: Upon completion of this unit the student will have met all of the requirements of Personnel Readiness Capability Program skill level 162.1 (roofing) involving wood and composition shingles rool roof coverings and built-up roofing coverings. The installed roof covering will be accomplished by following the job sheet procedures and will meet all the specifications as stated on the job sheet.

Enabling Objectives: Upon completion of this topic the student will be able to use common composition shingling tools in laying out, preparing and applying composition shingles and valley flashing to an intersecting roof by following procedures in accordance with Job Sheet SCBT 162.1 BU JS 1.2.2.1, "Laying Composition Shingles". The completed composition shingled roof will have the valley flashing laid in the valley of the roof without kinks, the valley shingle space opening will be straight and within 5 1/2" to 6 1/2" wide, nails will not be driven in the valley flashing within the smaller edge crimp, and all shingles will be laid to within ± 1/8" off 5" weather exposure.

Criterion Test: The student will install valley flashing and apply composition shingles to an intersecting roof. The completed roof covering will have the valley flashing laid without kinks, the shingle spacing for the valley opening will be within 5 1/2" to 6 1/2", nails will not be driven in the valley flashing with the valley flashing edge crimp, and all shingles will be laid to within ± 1/8" off 5" to the weather.

e. Chalkline.

f. Tin snip.

2. Materials.

a. Roofing felt.

b. Roofing nails - 7/8".

c. Composition shingles.

d. Valley flashing.

e. Wood strips, 3/8" x 2".

f. Nails, 6d and box.

D. Training Aids and Devices:

1. Samples of roofing materials.

a. Valley flashing.

b. Composition shingles.

c. Composition capping.

2. Locally Prepared Materials.

a. Job Sheet.

(1) SCBT 162.1 BU JS 1.2.2.1, "Laying Composition Shingles".

E. Training Aids Equipment:

1. None

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
I. Introduction to the Lesson		
A. Establish control		
1. Name	I.A. 1 Introduce self	
2. Topic: Composition Shingling Roof Covering.	I.A. 2 Introduce topic	
B. Establish readiness		
1. Composition shingle is used extensively as roof covering for homes. It will be to your advantage to learn this task. Composition shingle is used on roof sloping 4 inches or more rise to a foot.	I.B.1 Motivate student on Composition shingles.	
2. Assignment		
a. Read;		
(1) Builder 3 & 2, pages 348 - 352.		
C. Establish effect		
1. Value		
a. Pass course		
b. Perform better on the job		
c. Get advanced		
d. Be a better Builder		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
D. Overview		
1. Job Sheet - to help you follow instruction being given and to help you in the field exercise.	I.D. State learning objective: a. Upon completion of this topic you will be able to lay out, prepare the roof with valley flashing and guide strips and apply composition shingles on an intersecting roof.	
2. Pay close attention to the demonstration by the instructor.		
3. Ask questions.		
4. Stress safety.		
II. Presentation		
A. Introduce Job Sheet	II.A Hand out job sheets.	
1. SCBT 162.1 BU JS 1.2.2.1 "Laying Composition Shingle".		
B. Roof shingling terms.	II.B Give a brief lecture on terms.	
1. Square - area 10 X 10 ft or 100 sq. ft.		
2. Three bundles to a square - it will take three bundles of composition shingles to cover a square.		
3. Rake - edge of roof sheathing.		
4. Five inches to the weather - exposed surface of the shingle is five inches.		
C. Tools and Material		
1. Composition shingle		
2. Composition capping		

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OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
3. Valley flashing.		
4. Shingling hatchet.		
5. Nail, roofing 7/8".		
D. Procedures		
1. Roof preparation	II.D.1 Take student out to the field and give a brief demonstration/lecture on preparation.	
a. Clean		
b. Assure sheathing is nailed solid.		
2. Composition shingle application on a gable roof.	II.D.2 Give a brief demonstration/lecture on the application of a composition shingle to reinforce lecture.	II.D.2 Turn to job sheet and follow instruction being given on job sheet.
3. a. Apply building felt.	a. Call student attention to SCBT 162.1 BU JS 1.2.2.1	
(1) Start at the rake and lay felt flush with eave.		
(2) Spot nail to hold felt in place.	Note: Demonstration should be limited to the laying of a few starter shingle and the laying of a few full shingle. Use shingling hatchet.	
(3) From the top edge of 1st sheet measure up 32 inches - there should be a mark at approximately 5'0" on center.		
(4) Lay next sheet to the marking and spot nail as necessary.		
Note: Stop laying of asphalt felt at this point, the felt is to be laid as needed in the placement of composition shingle. If felt is laid too far in advance the wind will blow the felt completely off before shingles could be laid over them.		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY

b. Snap guide line for 1st course of composition shingle.

(1) Eleven and 5/8 inches from the eave - this will give a 3/8 " overhang.

c. Secure 3/8 inch thick guide strip at the rake.

d. Lay inverted shingle starter course.

(1) Cut off 5 inches from 1st shingle.

(2) Place nail 2 inches from edge of shingle and in line with the cut-outs.

e. Lay starter shingles.

(1) Start with a full sheet.

(a) Nails to be placed 1 inch above and in line with cut-outs.

(b) Nails at the ends at 1 inch in and in line with other nails.

(c) Four nails per shingle.

(2) Cut off 5 inches from a full shingle.

(a) Assure cut end be on the guide strip end of shingle.

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(b) Secure this piece of shingle flush with guide strip and with 5 inches exposure to the weather on the 1st course starter shingle.

(3) Cut off 10 inches from the next starter shingle and secure.

(4) In similar manner cut off 5 inches more on each succeeding starter shingle until 6 starter courses are laid.

f. Lay course shingle.

(1) Lay and secure a full shingle butt against the 1st course starter shingle and in line with the inverted shingles.

(2) Lay and secure a full shingle butt against the 2nd course starter shingle and with 5 inches exposure to the weather on the 1st course shingle.

(3) In like manner lay and secure shingles across and over the entire roof.

(4) The end shingles are to be cut as necessary to be flush with the guide strip.

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OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY

g. Calculate for pieces of capping.

(1) Divide length of ridge in inches by 5.

(2) Add four more pieces to the resulting quotient for the doubling of the starter and double closure capping.

h. Prepare for capping.

(1) Cut full shingle in 3 sections.

i. Cap the ridge.

(1) Measure and mark 6 inches from top of ridge - one side of roof and at each end of the roof.

(2) Snap chalk line.

(3) Lay starter cap to the line and flush with the guide strip - nail one nail on each side of roof, 2 inches in from the rake and 1 inch from edge.

(4) Lay another capping directly over this piece and secure with nail 6 inches from the rake and 1 inch in from the edge.

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
(5) Lay and secure capping to the midpoint of the ridge such that the previously laid capping is exposed 5 inches to the weather.		
(6) Secure final capping with 3 nails on each side.		
(7) With roofing cement cover nail head on the top final capping.		
j. Remove rake guide strip and sweep down roof.		
4. Composition shingle application on an intersecting roof.	II.D.4 Give a brief demonstration/ lecture in working on an intersecting roof.	
a. Install valley flashing.	Note: Demonstration may be limited to the laying out of shingle valley opening and the cutting of a few shingles.	
(1) Snap guide line in laying of valley flashing.		
(2) Scribe and cut for lower end of flashing.		
(3) Position and secure valley flashing.		
(a) Nails to be secured outside of smaller crimp on the edge.		
(b) Snap guide line for open valley finish.		

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OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
(1) From the center of splash rib measure and mark 3 inches on both sides at the top and bottom of valley flashing.		
(2) Snap lines through these points.		
c. Laying composition shingles to the valley.		
(1) Lay shingle in position.		
(2) Mark top and bottom of shingle in line with guide line.		
(3) Turn shingle over and cut.		
(4) Relay shingle in position and secure.		
III. Application		
A. Student practice.	III.A Rotate student around so that all may practice.	III.A Practice in all phases in application of composition shingle.
1. Laying of starter shingles.		
2. Laying of full course shingle.		
3. Laying of capping.		
4. Cutting of a valley shingle.		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY

IV. Summary

A. Composition roof shingling terms.

1. Square

2. Three bundles to a square.

3. Rake

B. Tools and materials.

1. Composition shingle

2. Composition capping

3. Valley flashing

4. Shingling hatchet

C. Composition shingle application per gable roof.

1. Install 3/8 inch wide strip at rake.

2. Apply building felt.

3. Apply lst course of inverted shingles with 3/8 inch overhang.

4. Apply starter shingles.

5. Apply cappings.

D. Composition shingle application for intersecting roof.

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OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY

1. Install valley flashing.

2. Snap guide line to have 6 inches of shingle open valley

3. Install shingles.

4. Install cappings.

V. Test.

A. Student will perform criterion test as stated.

NAVAL CONSTRUCTION TRAINING CENTER
PORT HUENEME, CALIFORNIA 93043
SPECIAL CONSTRUCTION BATTALION TRAINING (SCBT) 162.1
JOB SHEET

TITLE: Laying Composition Shingles

INTRODUCTION: This job sheet is to guide you in the application of composition shingles on a roof.

REFERENCES:

1. Builders 3 & 2, NAVPERS 10648-F
2. Manufacture, Selection and Application of Asphalt Roofing and Siding Product, Asphalt Roofing Manufactures Association.

TOOLS AND EQUIPMENT:

1. Measuring tape.
2. Chalk line and reel.
3. Tin snip
4. Shingling hatchet.
5. Linoleum knife.
6. Nail Apron.

MATERIALS:

1. Composition shingles.
2. Nails, roofing, 7/8".
3. Wood strips, 3/8 X 2".
4. Flashing, valley.
5. Felt, asphalt, 15#.
6. Nails, 6d, box.

PROCEDURES:

1. Apply 15# asphalt felt.
    a. Starting with the rake and flush with the eave of the roof unroll and lay sheet of felt.

b. Spot nail to hold felt in place.

c. From the top edge of felt measure up 32 inches and place markings at approximately 5'0" on center.

(1) For easy spotting of the mark, circle the mark.

d. Roll out another sheet to the mark and spot nail as necessary.

NOTE: Asphalt felt should be laid as needed in the placement of composition shingle from this point.

(1) Placing the sheet to the mark will allow for a 4 inch overlap.

2. Snap guide line for first course of composition shingle.

a. At each end of the roof slope measure up 11 5/8" from the eave.

(1) 11 5/8" will allow for a 3/8 inch shingle overhang.

b. Snap a chalk line through these points.

3. Secure 3/8 inch thick guide strips at the rake.

a. Tack 3/8 inch thick strip at the rake for overhang allowance.

4. Lay starter course of inverted shingle.

a. Cut off 5 inches from a full shingle.

(1) Shingles are laid and inverted and doubled on the first course to back up the first course of shingles and to fill in the spaces between the tabs.

b. Lay shingles (inverted) flush with guide strip and in line with guide line.

c. Secure with roofing nails 2 inches from the edge and in line with cut-outs.

d. Continue to lay and secure inverted shingles to the other rake-cut shingles as necessary to be flush with guide strip at the other end.

5. Lay starter shingles.

a. Lay and secure a full shingle directly over the inverted shingle, flush with the guide strip and in line with guide line. Nails are to be driven 1 inch above and in line with

the cut-outs and one at each end 1 inch in and in line with the other nails.

b. Cut off 5 inches from one end of a full shingle such that the cut end will be on the guide strip.

(1) The 5 inch off set of shingles will disburse the flow of rain (water) evenly over the roof, thus giving the roofing a longer life - the cut off remnant may be saved to use at the other end.

c. With the use of a shingling hatchet set at 5 inches, lay and secure this shingle flush with the guide strip and with 5 inches exposure to the weather on the first course starter shingle - this will be the starter shingle for the second course of shingles.

d. In similar manner cut off 10 inches from a full shingle and lay starter shingle for the 3rd course of shingles.

e. Cut off 15 inches from a full shingle and lay starter shingle for the 4th course of shingles.

f. Cut off 20 inches from a full shingle for the 5th course of shingles.

g. Cut off 25 inches from a full shingle for the 6th course of shingles.

(1) A man should be able to comfortably lay 6 courses of shingles at a time.

6. Lay course shingle.

a. Lay and secure a full shingle butt against the starter shingle of the 1st course and in line with the inverted shingles of the course.

b. Lay and secure a full shingle butt against the starter shingle of the 2nd course and with 5 inches of exposure to the weather or the shingle of the 1st course.

c. In similar manner lay and secure shingles across the roof and over the entire roof.

(1) Use chalk line to correct irregularities in straightening the course of shingles.

d. The end shingle must be cut to be flush with the guide strip.

7. Calculate for pieces of cappings needed for ridge.

   a. By dividing the length of the ridge (in inches) by 5.

   b. Add 4 more peices to the resulting quotient for the actual amount needed.

      (1) Double capping for each end and double for the final capping.

8. Preparing cappings.

   a. By cutting the shingles into 3 sections - cut from the back side of the shingle.

9. Cap the ridge.

   a. From the top of the ridge measure and mark, on one side of the roof, 6 inches at each end.

   b. Snap a chalk line through these points.

   c. Lay a starter cap such that the cap is flush with the guide strip and guide line.

   d. Nail this cap on one side 2 inches from the rake and 1 inch from the edge.

      (1) Starter cappings are to be doubled.

   e. Folding this cap over the ridge and nail it down as in step 9d.

   f. Lay another capping piece directly over the starter cap and secure with nail 6 inches from the rake and 1 inch form the edge.

      (1) Nail is driven 6 inches from the end so that the next cap placed in position will cover the nail.

   g. Lay and secure capping over the starter cap such that 5 inches of the starter cap is exposed to the weather and the edge of the capping will be in line with the guide line.

   h. Lay as many cappings as necessary to midpoint of ridge.

   i. Start from the other end of ridge to midpoint.

   j. Final cappings are nailed one at a time with 3 nails to each side.

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k. With the use of roofing cement cover nail heads on the top final cappings.

10. Remove rake guide strips.

a. With the use of a hammer remove tack nails holding guide strips.

11. Clean up work site.

a. With the use of a broom, sweep down all loose materials on roof.

b. Clean up ground around work site

12. Check work with instructor.

a. Call instructor.

(1) Shingles must be laid such that they are within 3/8 inch in line, shingle not to be exposed more than 5 1/2 inches nor less than 4 1/2 inches, to the weather and that there be no nail heads exposed.

The following is to help guide you when working with an intersecting roof.

13. Install valley flashing.

a. Measure distance on the prefabricated valley flashing from the splash rib to the edge.

b. On one side of the valley measure out and mark this distance at the top and bottom end of valley.

c. Snap a chalk line through these points.

d. Lay a section of flashing with its edge aligned to the guide line and the lower end even with the eave.

e. Scribe cut for lower end of flashing such that the flashing will be flush with the eave.

f. Using a tin snip, cut out this scribed portion.

g. Reposition this flashing with the cut end flush with eave and with one edge in alignment with guide line.

h. Secure flashing to roof with nails driven in the edge outside of the smaller crimp on the edge.

(1) The crimp of the edge of the flashing is to prevent rain water from back washing.

i. Lay remainder of valley flashing with 4 inch cover up.

14. Snap guide line for open valley finish.

a. From the center of splash rip measure and mark 3 inches on both sides at the top and bottom of valley flashing.

b. Snap a chalk line through these points.

15. Laying composition shingles to the valley.

a. Lay shingle overlapping the valley.

b. Using linoleum knife mark shingle at top and bottom in line with the guide line.

c. Turn shingle over and with the use of a straight edge and a linoleum knife cut shingle as necessary.

d. Lay shingle in position and secure.

16. Check work with instructor.

a. The valley flashing must be laid in the valley of the roof without a kink. The opening between the shingles over the valley flashing must be within 5½ to 6½ inches and any nails must not be driven in the valley flashing within the smaller crimp on the edges.

NAVAL CONSTRUCTION TRAINING CENTER
PORT HUENEME, CALIFORNIA 93043
SPECIAL CONSTRUCTION BATTALION TRAINING (SCBT) 162.1

Classification: Unclassified.

Topic: Wood Shingle Roof Covering

Average Time: 2 Periods (Class) 2 Periods (Pract)

Instructional Materials:

A. Text: None

B. Reference:

1. Fundamentals of Carpentry, Volume 2, W.E. Durbahn/E.W. Sundberg, American Technical Society.

C. Tools, Equipment and Materials:

1. Tools.

a. Measuring tape.

b. Chalkline and reel.

c. Hatchet, shingling.

d. Nail apron.

2. Materials.

a. Wood shingles, 16", 2 1/2" to the butt.

b. Nails, 3d, box, galvanized or blued.

Terminal Objectives: Upon completion of this unit the student will have met all the requirements of Personnel Readiness Capability Program skill level 162.1 (roofing involving wood and composition shingles, roll roof coverings and built-up roofing coverings. The installe roof coverings will be accomplished by following job sheet procedures and will meet all the specifications as stated on the job sheet.

Enabling Objectives: Upon completion of this topic the student, as a class member, will be able to orally answer key questions pertaining to laying out, preparing and applying wood shingle covering on a roof. All answers must be compatable with Information Sheet SCBT 162.1 BU IS 1.2.3.1, "Laying Wood Shingles". The student will be provided with required information sheet.

Criterion Test: The class as a group will be tested on their ability to orally answer specific questions pertaining to this course of instruction.

Homework: None

c. Nails, 8d, box

d. Wood strips, 1" (full) x 2".

D. Training Aids and Devices:

1. Samples.

a. Wood shingles.

b. Five shingles nailed together.

(1) 2 and 1/2 inches to the butt.

2. Locally Prepared Materials;

a. Information Sheet.

(1) SCBT 162.1 BU IS 1.2.3.1, "Laying Wood Shingles".

E. Training Aids Equipment.

1. None

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
I. Introduction to the lesson		
A. Establish control		
1. Name	I.A.1 Introduce self	
2. Topic: Wood Shingle Roof Covering.	I.A.2 Introduce topic	
B. Establish readiness.		
1. Wood shingle like composition shingle is used extensively as roof covering and are used on roof sloping 4 inches or more rise to a foot. Wood shingles cost more than composition shingles. Tasks of laying wood shingles and composition shingles are similar, except in the area of overhanging at the rake and eave of the roof.	I.B.1 Motivate student by reading the statement on wood shingles.	
C. Establish effect		
1. Value		
a. Pass course		
b. Perform better on the job		
c. Get advanced		
d. Be a better Builder		
D. Overview	I.D State learning objectives.	
1. Job sheet - to help you follow instruction being given	a. Upon completion of this you will be able to lay out, prepare and apply wood shingles on a roof.	

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
2. Pay close attention to the demonstration by the instructor.		
3. Ask questions		
4. Stress safety		
II. Presentation		
A. Introduce information sheet.	II.A Hand out job sheets.	
1. SCBT 162.1 BU IS 1.2.3.1, "Laying Wood Shingles".		
B. Wood shingle roofing terms	II.B Give a brief lecture on terms, reinforce lecture with sample of 5 shingles nailed together.	
1. Four and 1/2 bundles to a square - it takes 4½ bundles of wood shingles to cover a square.		
2. Two and 1/2 inches to the butt - five shingles together at the butt end will measure 2 1/2 inches.		
C. Tools and materials	II.C Give a brief lecture on tools and materials - show samples of wood shingle and shingle capping to reinforce lecture.	
1. Wood shingles		
2. Wood shingle capping - preassembled		
D. Procedure		
1. Roof preparation	II.D.1 Take student out to the field and give a brief demonstration/lecture on preparation.	
a. Clean		
b. Assure sheathing is nailed solid.		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
2. Wood shingle application on a gable roof. a. Secure 1" X 2" guide strip at the rake. b. Lay 1st course starter shingles. (1) Flush with guide strip. (2) One and 1/4 inch projeccion over the eave. (3) Double the shingles. c. String guide line. d. Lay 1st course of (lower) double shingle with 1/8 to 1/4 inch spacing and with nails placed: (1) One inch in from the edge. (2) Three inches above the butt end. e. Double this course. (1) One inch in from the edge. (2) Six and 1/2 inches above the butt end. (3) One and 1/2 inches side lap breaks. f. Lay starter shingle. (1) Shingling hatchet set at 5".	II.D.2 Give a brief demonstration/lecture on wood shingle application. Call student attention to information sheet SCBT 162.1 BU IS 1.2.3.1.	II.D.2 Turn to job sheet and follow demonstration/lecture.

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
(2) Lay starter shingles for 4 courses such as they are: (a) Flush at the edge with the guide strip. (b) Expose 5 inches to the weather. (c) Spacing between shingles are 1/8 - 1/4 inch. (d) Shingles laid in a step like manner.		
g. Lay shingles to cover entire roof.		
NOTE: Lay a few more shingles - need not cover roof.		
III. Application		
A. Student ask and answer questions to clear all doubtful areas.	III.A Answer questions by the students - have some questions prepared to ask the students.	III.A. Ask and answer questions.
NOTE: Since this task is similar to the laying of composition shingles, this portion of training will be limited to demonstration/ lecture by the instructor.		
IV. Summary		
A. Wood shingle roofing terms.		
B. Wood shingle application procedure.		
1. Roof preparation.		
2. Install guide strips.		

OUTLINE OF INSTRUCTION | INSTRUCTOR ACTIVITY | STUDENT ACTIVITY

3. Lay 1st course of double shingles.

4. Lay starter shingle.

5. Spacing of shingles 1/8 - 1/4 inch.

6. Only two nails to a shingle.

7. Shingle should not be more than 9 inches wide.

8. Side lap breaks to be at least 1 1/2 inches.

V. Test.

A. Students will perform criterion test as stated.

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NAVAL CONSTRUCTION TRAINING CENTER
PORT HUENEME, CALIFORNIA 93043
SPECIAL CONSTRUCTION BATTALION TRAINING (SCBT) 162.1

INFORMATION SHEET

TITLE: Laying Wood Shingles

INTRODUCTION: This information sheet is to guide you in the application of wood shingles on a roof.

REFERENCES:

1. Fundamentals of Carpentry, Volume 2,
   W.C. Durbahn/E.W. Sundberg, American Technical Society.

TOOLS, EQUIPMENT AND MATERIALS:

1. Tools

   a. Measuring tape.

   b. Chalkline and reel.

   c. Shingling hatchet.

   d. Nail apron.

2. Materials.

   a. Wood shingles, 16", 2 1/2" to the butt.

   b. Wood strips, 1" (full) x 2".

   c. Nails, 3d, box, galvanized or blued.

   d. Nails, 8d or box.

PROCEDURES:

1. Secure 1" (full) x 2" guide strip at the rake.

   a. At each gable of the roof, tack the full inch strips for shingle overhang allowance.

2. Lay first course starter shingles.

   a. At each end of the roof, lay and secure the lower member of the first course shingles such that its edge is flush with the guide strip and the butt end of the shingle projecting 1 1/4" over the eave.

b. Double these shingles at each end with a narrower shingle that will be flush at the outer edge and at the bottom end.

3. String guide line.

a. Drive a nail 3/4 of the way in the butt end of the lower member of the first course shingle.

b. Fasten guide line to the nails.

(1) Line must be taut and against the shingle.

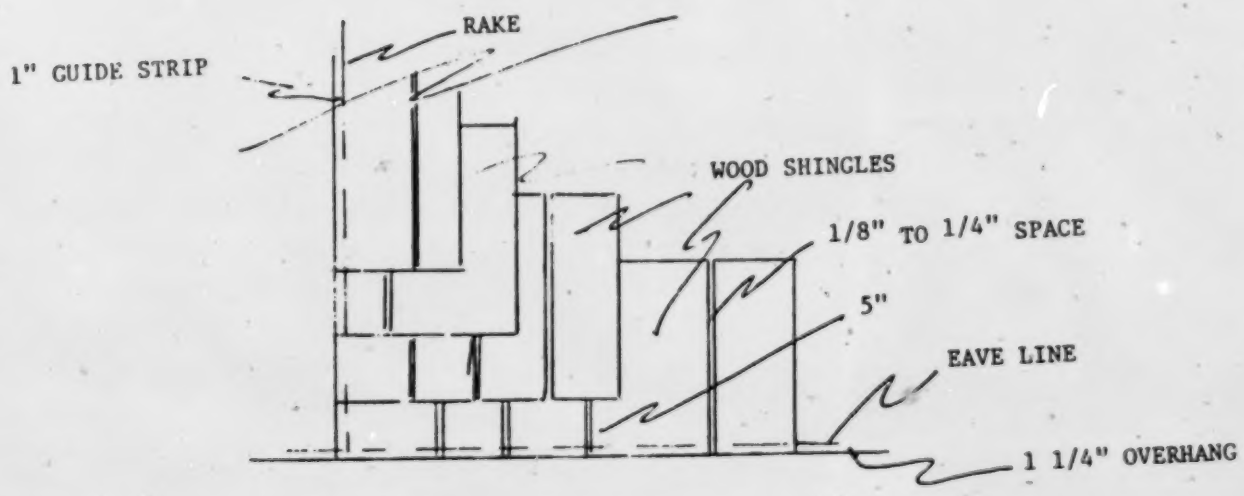
4. Lay first course of double shingles.

a. Lay and secure shingles across the roof such that the spacing between the shingles are 1/8" - 1/4" apart and the butt end aligned to the guide line. Drive the nails approximately 3 inches above the butt end and 1 inch in from the ridge.

b. Double this course by alying a second row of shingles over the roof such that the butt ends are flush, 1/8" to 1/4" sp spacing between the shingles and with about 1 1/2" sidelap breaks. Drive the nails about 6 1/2" above the butt and 1" in from the edge.

5. Lay starter shingle.

a. With the use of the sheathing hatchet, set at 5", lay and secure 4 more courses of starter shingles that are: flush at the edges with the guide strip exposed 5" to the weather, 1/8" to 1/4" spacing between shingles and laid in a step like manner as shown:



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6. Lay and secure shingle to cover entire roof.

   a. In like manner shingle can be laid over the entire roof.

NOTE: Only two nails per shingle and that each piece of shingle should not be wider than 9 inches.

NAVAL CONSTRUCTION TRAINING CENTER
PORT HUENEME, CALIFORNIA 93043
SPECIAL CONSTRUCTION BATTALION TRAINING (SCBT) 162.1

Classification: Unclassified.

Topic: Course Summarization

Average Time: 1 Period (Class) 2 Periods (Pract)

Instructional Materials:

A. Texts:

1. Builder 3 & 2, NAVPERS 10648-F.

B. References:

1. Fundamentals of Carpentry, Volume 2, W.E. Durbahn/E.W. Sundberg.

2. Interior and Exterior Trim, Delmar Publishers.

3. Manufacture, Selection and Application of Asphalt Roofing and Siding Products, J.L. Straham, Eleventh Edition Asphalt Roofing Manufacturer's Association.

C. Tools, Equipment and Materials:

1. Tools.

a. Hammer.

b. Flat nose shovel.

Terminal Objectives: Upon completion of this unit the student will have met all of the requirements of Personnel Readiness Capability Program skill level 162.1 (roofing) involving wood and composition shingles, rool roof covering and built-up roofing coverings. The installed roof coverings will be accomplished by following job hseet procedures and will meet all the specifications as stated on the job sheet.

Enabling Objectives: Upon completion of this topic the student will have reviewed the methods used in the application of the various roof coverings as the coverings are being removed. All salvagable roofing materials will be clear of nails and will be neatly stacked.

Criterion Test: The student will remove the roof covering materials. All salvagable roofing materials will be clear of nails and will be neatly stacked.

Homework: None

c. Wrecking bar.

d. Broom.

D. Training Aids and Devices:

1. None

E. Training Aids Equipment.

1. None

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
I. Introduction to the lesson.		
A. Establish contact.	I.A. Introduce self and topic.	
1. Name:		
2. Topic: Course Summarization		
B. Establish readiness.	I.B. Motivate student by stating the purpose.	
1. Purpose of this topic is to review what we have learned in this course of training and to clean up our work area.		
C. Establish effect.	I.C. Upon completion of this topic you will have reviewed the methods used in the completion of built-up roofing and asphalt composition roofing projects.	
1. Value.		
a. Perform better on the job.		
b. Be a better builder.		
D. Overview.		
1. Stress safety.		
2. Ask questions.		
II. Presentation.		
A. Built-up roofing.		
1. Building paper.		
2. Dry nailer.		
3. Hot ply.		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
B. Composition shingle.		
1. Overhang 3/8".		
2. 5" to the weather.		
3. Double course for starter.		
C. Wood shingle.		
1. Overhang 1 1/4".		
2. 5" to the weather.		
3. Double course for starter.		
4. Shingles be spaced 1/8 to 1/4 inches.		
III. Application.		
A. Student dismantle roofing and clean up work area.	III.A. Supervise work - stress safety.	III.A. Work as a team member.
IV. Summary.		
A. Built-up roofing.		
B. Composition shingle.		
C. Wood shingles.		

CHAPTER 12
EXTERIOR FINISH

Chapter 10 and 11 have dealt with the FRAMING of a wood-frame structure, the framing consisting of (1) the main supporting framework of joists, studs, rafters, and other structural members; and (2) the subflooring and the wall and roof sheathing, which strengthen and brace the framing. These structural elements constitute the ROUGH CARPENTRY in the structure.

The remainder of the work on the structure consists of the construction and/or installation of nonstructural elements. This work is called the FINISH. Most of the finish involves items of essential practical usefulness, such as the door and window frames, the doors and windows themselves, the roof covering, and the stairs. Some of the finish, however, such as the casings on doors and windows and the moldings on cornices and on inside walls, is purely ornamental. The part of the finish which is purely ornamental is called TRIM.

The finish is divided into EXTERIOR FINISH and INTERIOR FINISH. The principal parts of the exterior finish are the CORNICES, the ROOF COVERING, ASBESTOS-CEMENT SIDING, INSULATION, and the OUTSIDE-WALL COVERING. The order in which these parts are erected may vary slightly, but since the roof covering must go on as soon as possible, the cornice work is usually the first item in the exterior finish.

CORNICE WORK

The rafter-end edges of a roof are called EAVES. A hip roof has rafter-end edges all the way around, and all four edges of a hip roof are therefore eaves. The rafter-end or sidewall edges of a gable roof are eaves; the gable-end or end-wall edges are called RAKES.

The exterior finish at and just below the eaves is called the CORNICE. Purely ornamental parts of a cornice (consisting mainly of molding) are called CORNICE TRIM. Exterior finish which runs up the rakes of a gable roof is called GABLE CORNICE TRIM. Besides the main roof, the additions and dormers (if any) also have cornices and cornice trim.

TYPES OF CORNICES

The type of cornice required for a particular structure is indicated on the wall sections, and there are usually cornice detail drawings as well. A roof with no rafter overhang usually has the SIMPLE cornice shown in figure 12-1. This cornice consists of a single strip called a FRIEZE, which is beveled on the upper edge to fit close under the overhang of the eaves, and rabbeted on the lower edge to overlap the upper edge of the top course of siding. If trim is used it usually consists of molding placed as shown in the figure. Molding trim in this position is called CROWN molding.

A roof with a rafter overhang may have an OPEN cornice or a CLOSED (also called a BOX) cornice. The simplest type of open cornice is shown in figure 12-2. Like the simple cornice, it consists only of a frieze, which in this case must be notched to fit around the rafters. If trim is used, it usually consists of molding cut to fit between the rafters as indicated. Molding trim in this position is called BED molding.

A closed or box cornice is shown in figure 12-3. In this type the rafter overhang is entirely boxed in by the roof covering, the fascia, and a bottom strip called a PLANCIER. The plancier is nailed to the lower edges of a series of horizontal members called LOOKOUTS, which are cut to fit between the rafter ends and the face of the sheathing. The frieze, if any, is set just below the lookouts. The trim, if any, is placed and named as shown in the figure.

The gable cornice trim on a gable-roof structure with a simple or an open cornice is made by carrying the frieze and the crown molding up the rakes as shown in figure 12-4. Molding trim along the rakes, however, is called RAKE molding.

Figure 12-5 shows gable-end-wall cornice work on a gable-roof structure with a closed cornice. As you can see, the crown molding and the fascia are carried up the rakes to form the gable cornice trim.

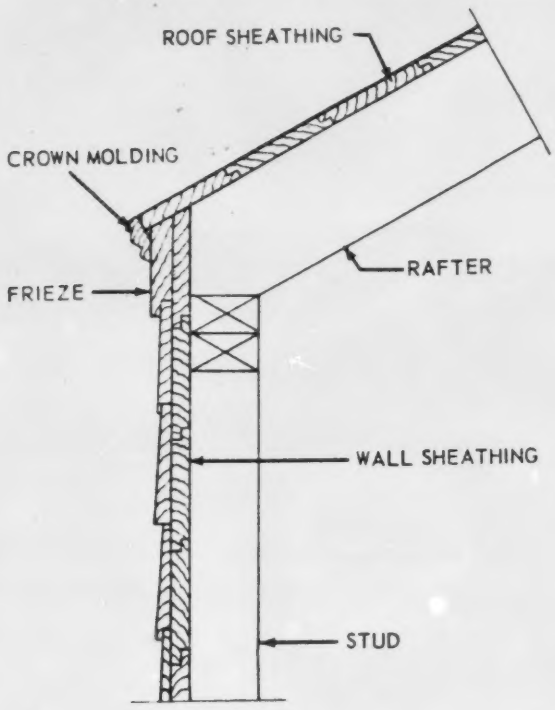

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Figure 12-1.—Simple cornice.

CORNICE CONSTRUCTION

Most specifications call for BUILDING PAPER between the sheathing and the siding. Building paper is impregnated with some waterproofing material such as asphalt or paraffin; it is used to make the walls water-tight and to keep out air and dust. It is usually applied horizontally, with a 2- to 4-in. overlap.

Before the cornice can be erected, the top course of building paper must be applied to the sheathing. For the open and closed cornice the paper must be cut to fit around the rafters.

Constructing a simple or an open cornice is simply a matter of laying out, beveling, rabbeting, notching (if required) and nailing on the frieze and the trim. Nails should be coated-casing, or finish; the size depends on the thickness of the piece being set in place. Carry a supply of 4-penny, 6-penny, and 8-penny nails, and drive nails in only part way until all the pieces of the cornice have been set in place. All joints should be planed smooth with a block plane and fitted together tightly. All members must be mitered for joining on outside corners and mitered or coped for joining on inside corners.

The normal procedure for constructing a closed cornice is as follows:

1. Line up the tail plumb cuts and lower corners of the rafters by stretching a line and planing or sawing down any irregularities.
2. Lay out and cut the lookouts and nail them in place (if this was not done in the framing stage). Lookouts must be level, with bottom edges and outer ends in perfect alignment. Each lookout should be first nailed to the rafter and then toenailed against the ledger.
3. Lay out, cut, and rabbet the frieze, and nail it in place just below the lookouts.
4. Lay out and cut the plancier, and fit and nail it to the bottom edges of the lookouts.
5. Lay out, cut, and bevel the fascia, and nail it to the ends of the rafters and lookouts.
6. Lay out, cut, bevel (if necessary), and nail on the moldings.

ROOF COVERING

Roofs are covered with many different kinds of materials, such as slate, tile, wood shingles, asphalt, asbestos-cement, sheet metal, and BUILT-UP roofing. You are not likely to work with any specifications calling for slate, tile, sheet metal, or wood-shingle roofing. Built-up roofing is used mainly on flat or nearly flat roofs. On pitched-roof structures, asphalt and asbestos-cement are the types of roof covering most frequently used. For further details on roofing procedures, see NavFac Specification 7Yk—Roofing and Sheet Metal Work.

ASPHALT AND ASBESTOS-CEMENT ROOFING

Asphalt roofing comes in ROLLS (usually 36 in. wide, called ROLLED ROOFING), ROLLED STRIPS (usually 15 in. wide), FLAT STRIPS (usually 12 in. wide and 36 in. long), and as individual separate shingles. The type most commonly used is the flat strip, often called a STRIP SHINGLE.

A 12 x 36 SQUARE-BUTT strip shingle is shown in figure 12-6. This shingle should be laid 5 in. TO THE WEATHER, meaning that 7 in. of each course should be overlapped by the next higher course. The lower, exposed end of a shingle is called the BUTT; the shingle shown in figure 12-6 has a SQUARE BUTT,

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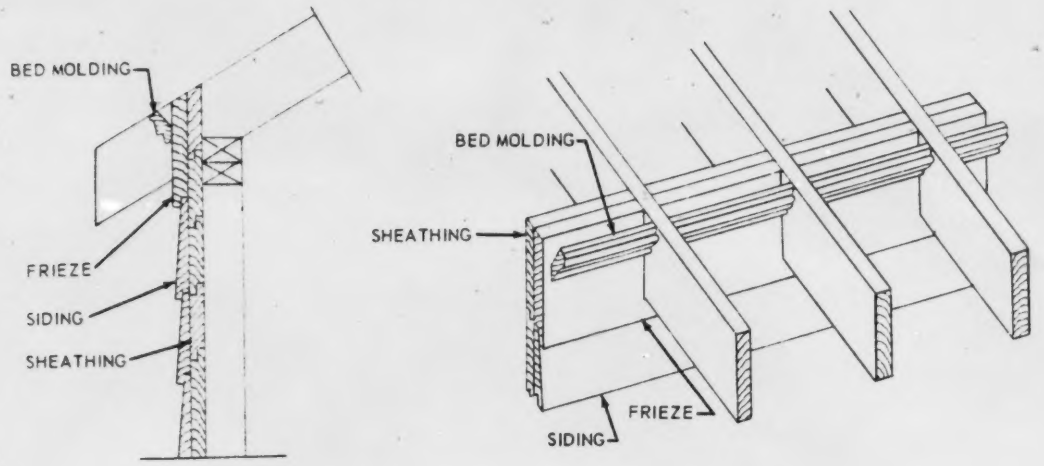

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Figure 12-2.—Simplest type of open cornice.

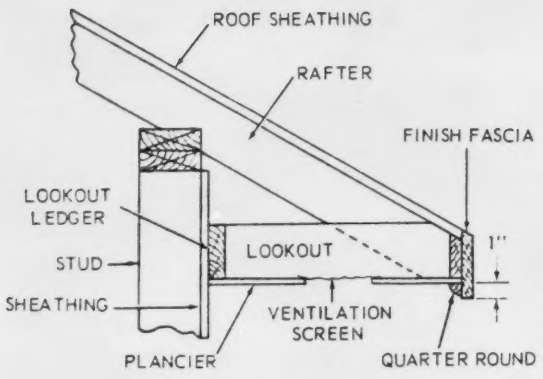

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Figure 12-3.—Closed or box cornice.

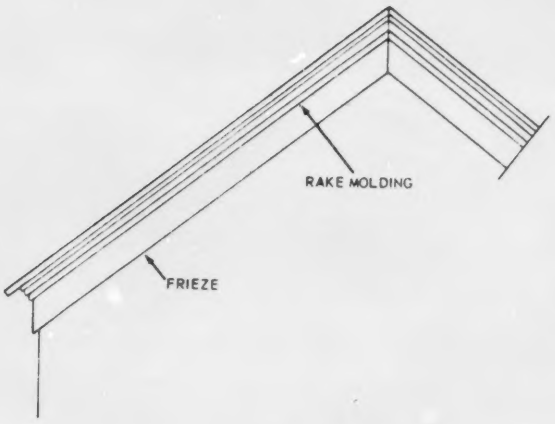

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Figure 12-4.—Gable cornice trim on gable-roof structure with simple cornice.

divided into 3 TABS. Various other butt shapes are manufactured.

Asbestos-cement roofing usually consists of individual shingles, 12 in. by 24 in. being the size most commonly used.

The first essential in covering a roof is to erect a scaffold extending to a height which will bring the eaves about waist-high to a man standing on the scaffold. Before any roof covering is applied, the roof sheathing must be swept clean and carefully inspected for irregularities, cracks, holes, or any other defects. No roofing should be applied unless the sheathing boards are absolutely dry. An UNDERLAY of ROOFING FELT is first applied to the sheathing. Roofing felt usually comes in 3-ft-wide rolls, and it should be laid with a 4-in. lap as indicated.

Before work begins, bundles of shingles should be distributed along the scaffold. There are 27 strips in a bundle of 12 x 36 asphalt strip shingles, and 3 bundles will cover 100 sq ft. After the first course at the eaves (called the STARTER course) is laid by inverting the first course of shingles, you begin each course which follows by stretching

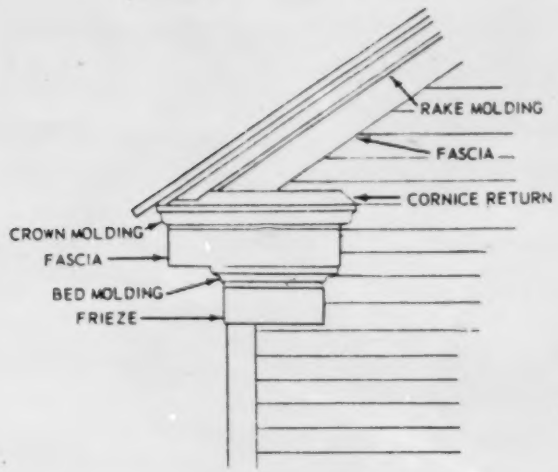

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Figure 12-5.—Gable-end-wall cornice work on a gable-roof structure with a closed cornice.

An asbestos-cement roof is laid in about the same manner.

SHINGLES AT HIPS AND VALLEYS

One side of a hip or valley shingle must be cut at an angle to obtain an edge line which will match the line of the hip or valley rafter. One way to cut these shingles is to use a pattern made as follows:

Select a piece of 1 x 6 about 3 ft long. Determine the UNIT LENGTH of a common rafter in the roof (if you don't already know it); set the framing square back-up on the piece to the unit run of a common rafter on the tongue and the unit length of a common rafter on the blade, as shown in the top view of figure 12-8. Draw a line along the tongue; saw the piece along this line, and use it as a pattern to cut the shingles as shown in the bottom view of figure 12-8.

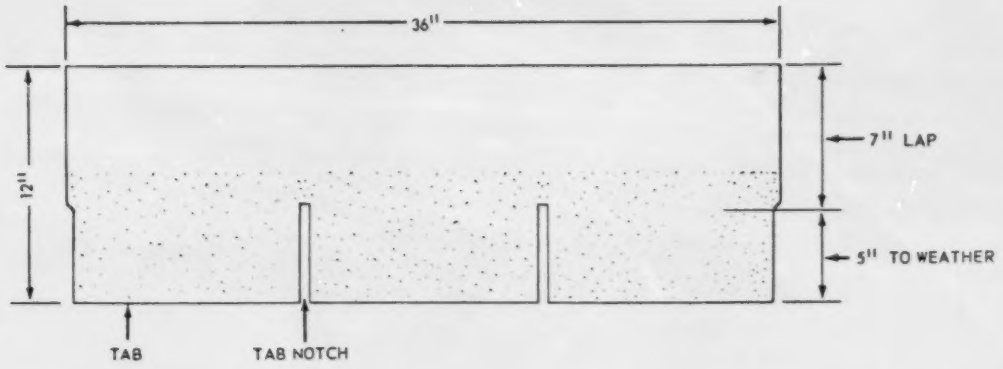

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Figure 12-6.—A 12 x 36 square-butt asphalt strip shingle.

a guide line or snapping a chalk line from edge to edge to position the course.

Figure 12-7 shows the method of laying a 12 x 36 asphalt strip-shingle roof.

Strip shingles should be nailed with 1-in. copper or hot-dipped galvanized roofing nails, 2 to each tab; this means 6 nails to each full strip. Nails should be placed about 6 1/2 in. from the butt edges, to ensure that each nail will be covered by the next course, and driven through 2 courses. Placing a nail so that it will be covered by the next course is called BLIND NAILING.

FLASHING

Places especially liable to leakage in roofs and outside walls are made watertight by the installation of FLASHING. Flashing consists of sheets or strips of a watertight, rust-proof material (such as galvanized sheet or sheet copper alloy for valleys and felt for hips), installed so as to deflect water away from places that are liable to leakage. The places in a roof most liable to leakage are the lines along which adjoining roof surfaces intersect (such as the lines followed by ridge hips and valleys), and

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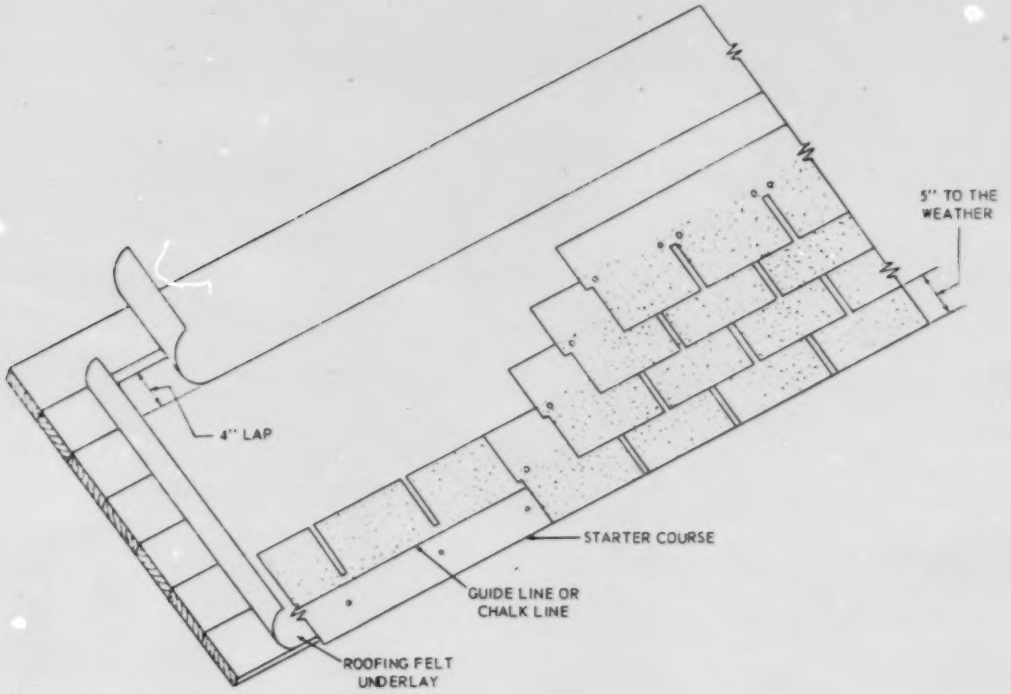

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Figure 12-7.—Laying an asphalt shingle roof.

the lines of intersection between roof surfaces and the walls of dormers, chimneys and skylights.

Ridge lines and hip lines tend naturally to shed water, and these lines are therefore only moderately subject to leakage. A strip of felt paper, applied as shown in figure 12-9, usually makes a satisfactory flashing for a ridge or hip. The ridge or hip is then FINISHED. On an asphalt shingle roof a ridge or hip may be finished as shown in figure 12-9. A sufficient number of SQUARES are made by cutting shingles into thirds and the squares are then blind-nailed to the ridge or hip as shown.

Since water gathers in the valleys of a roof they are highly subject to leakage. Valley flashing varies with the manner in which the valley is to be finished. There are two common types of valley finish, known as the OPEN valley and the CLOSED valley.

In working with an open valley, always remember that the roof covering does not extend across the valley. The flashing consists of a prefabricated piece of galvanized iron, copper, or some similar metal, with a SPLASH RIB or RIDGE down the center and a smaller CRIMP along each of the edges. The flashing is nailed down to the valley with nails driven in the edges, outside the crimps. Great care must be taken not to drive any nails through the flashing inside of the crimps. Puncturing the flashing inside the crimps is very likely to cause leaking.

In the closed valley the roof covering extends across the valley. Sheet metal flashing, cut into small sheets measuring about 18 in. x 10 in. and called SHINGLE TINS, is laid under each course of shingles, along the valley, as the course is laid. The first course of the double course at the eaves is laid, and the first sheet of flashing is placed on top of it. The second course is laid over the first course, and a sheet of flashing is then laid over this one so that the metal is partly covered by the next course. This procedure is continued all the way up the valley.

Shingle tins measuring about 5 in. x 7 in. are used in a similar manner to lay flashing up the side walls of dormers, chimneys, skylights, and the like. Each tin is bent at a right angle so that part of the tin extends up the side wall and the

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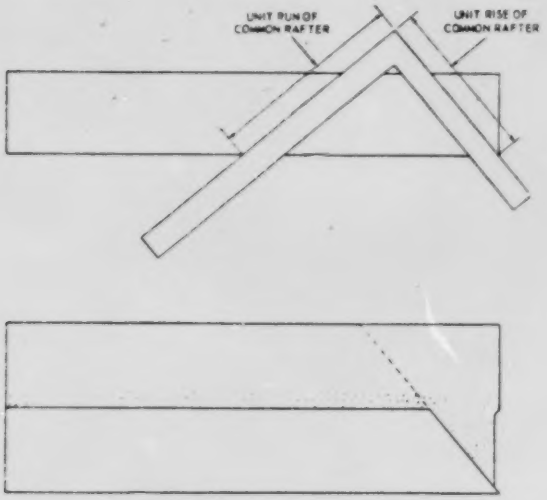

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Figure 12-8.—Laying out pattern for cutting hip and valley shingle.

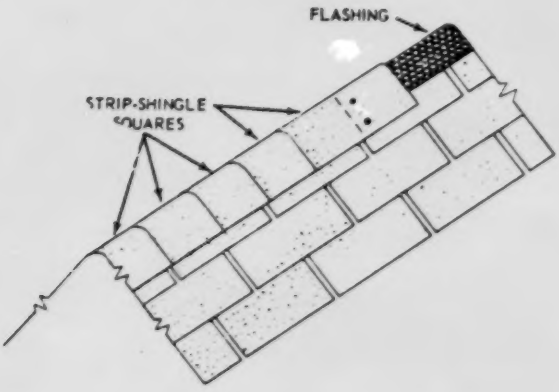

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Figure 12-9.—Hip or ridge flashing and finish on asphalt strip-shingle roof.

rest lies flat on the roof covering. Flashing of this type is called SIDE FLASHING. In addition to the side flashing, a dormer, chimney, or skylight has a strip of flashing called an APRON along the bottom of the outer wall or face and a chimney or skylight has a similar strip, called the SADDLE flashing, along the bottom of the inner wall or face.

BUILT-UP ROOFING

Built-up roofing consists of several layers of tar-rag-felt, asphalt-rag-felt, or asphalt-asbestos-felt set in a hot BINDER of melted pitch or asphalt. A final layer of binder is spread on top and sprinkled with a layer of gravel, crushed stone, or slag. Built-up roofing is confined to roofs which are no steeper than about 4 in 12. On steeper roofs the binder tends to work down and clog gutters and drains. Pitch binder should not be used on a roof steeper than 3 in 12. Asphalt binder may be used on somewhat steeper roofs. For built-up roofing, roof sheathing should be tight-laid and, preferably, doubled.

Each layer of built-up roofing is called a PLY. In a 5-ply roof the first two layers are laid without binder; these are called the DRY NAILERS. Before they are nailed in place, a layer of building paper is tacked down to the roof sheathing.

Built-up roofing, like shingling, is started at the eaves, so that strips will overlap in the direction of the watershed. Figure 12-10 shows the manner of laying 32-in. material to obtain 5-ply coverage at all points on the roof. Nailing must be in accordance with a predetermined schedule, designed to distribute the nails in successive plys evenly among the nails already driven. The roofing shown in figure 12-10 is laid as follows:

1. Lay the building paper with a 2-in. overlap as shown. Spot-nail it down just enough to keep it from blowing away.
2. Cut a 16-in. strip of saturated felt and lay it along the eaves. Nail it down with nails placed 1 in. from the back edge, spaced 12 in. on centers.
3. Nail a full-width (32 in.) strip over the first strip, in the same nailing schedule.
4. Nail the next full-width strip with the outer edge 14 in. from the outer edges of the first two, to obtain a 2-in. overlap over the edge of the first strip laid. Continue laying full-width strips with the same exposure (14 in.) until the opposite edge of the roof is reached. Finish off with a half-strip along this edge. This completes 2-ply dry nailer.
5. The 3-ply starts with one-third of a strip, covered by two-thirds of a strip and then by a full strip, as shown. To obtain a 2-in. overlap of the outer edge of the second full strip over the inner edge of the first strip laid, the outer edge of the second full strip must be 8 2/3 in.

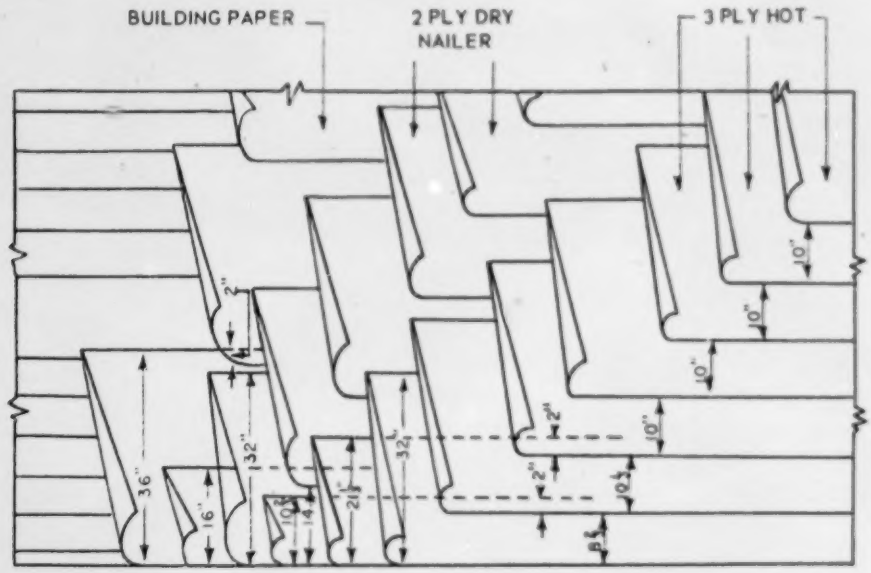

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Figure 12-10.—Laying a 5-ply built-up roof.

from the outer edges of the first three strips laid. To maintain the same overlap, the outer edge of the third full strip must be 10 1/3 in. from the outer edge of the second full strip. Subsequent strips may be laid with an exposure of 10 in. Finish off at the opposite edge of the roof with a full strip, two-thirds of a strip, and one-third of a strip, to maintain 3 plys throughout.

The binder is melted and maintained at proper temperature in a pressure fuel kettle. The kettle must be set up and kept level. If it is not level it will heat unevenly, and this creates a hazard. The first duty of the kettle man is to inspect the kettle, especially to ensure that it is perfectly dry. Any accumulation of water inside will turn to steam when the kettle gets hot. This may cause the hot binder to bubble over, which creates a very serious fire hazard. Detailed procedure for lighting off operating, servicing, and maintaining the kettle is given in the manufacturer's manual.

The kettle man must maintain the binder at a steady temperature, as indicated by the temperature gage on the kettle. Correct temperature is designated in binder manufacturer's specifications; for asphalt it is about 400° F. The best way to keep an even temperature is to add material pro rata as melted material is tapped off. Pieces must not be thrown into the melted mass, but placed on the surface, pushed under slowly, and then released. If the material is not being steadily tapped off, it may eventually overheat, even with the burner flame at the lowest possible level. In that case, the burner should be withdrawn from the kettle and placed on the ground, to be re-inserted when the temperature falls. Prolonged overheating causes flashing and impairs the quality of the binder.

Asphalt or pitch must not be allowed to accumulate on the exterior of the kettle, because of the fire hazard. If the kettle catches fire, close the lid immediately, shut off the pressure and burner valves, and, if possible, remove the burner from the kettle. Never attempt to extinguish a kettle fire with water. Use sand, dirt, or a chemical fire extinguisher.

A hot roofing crew consists of a mop man as shown in figure 12-11 and as many felt layers, broomers, nailers, and carriers as the size of the roof requires. The mop man is in charge of the roofing crew. It is his important responsibility to mop on only binder which is at the proper temperature. Binder which is too hot will burn the felt, and the layer it makes will be too thin. A layer which is too thin will eventually crack,

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Figure 12-11.—Applying built-up roofing.

and the felt may separate from the binder. Binder which is too cold goes on too thick, so that more material is used than is required.

The felt layer must get the felt down as soon as possible after the binder has been placed. If the interval between mopping and felt-laying is too long, the binder will cool to the point where it will not bond well with the felt. The felt layer should follow the mop man at an interval of not more than 3 feet. The broomer should follow immediately behind the felt layer, brooming out all air bubbles and imbedding the felt solidly in the binder.

Buckets of hot binder should never be filled more than three-fourths full, and they should never be carried at any speed faster than walking. Whenever possible, the mop man should work downwind from the felt layer and broomer, to reduce the danger of spattering. He must take every precaution against spattering at all times. He should LIFT his mop out of the bucket, not drag it across the rim. Dragging the mop in this manner may upset the bucket, and the hot binder may quickly spread to the feet, or, worse still, to the knees, of nearby members of the roofing crew.

OUTSIDE WALL COVERING

After the door and window frames, the outside-wall covering is the next major item in the exterior finish. On an all-wood structure the principal parts of the outside-wall covering are the WATER TABLE, the CORNER COVERING, and the SIDING, usually erected in that order.

WATER TABLE

The term water table may be applied to anything that is used to keep the water from running down the face of the foundation wall. A water table may also be used to form a starting point for the siding material and to improve the exterior appearance of the building. Figure 12-12 shows two common types of water tables.

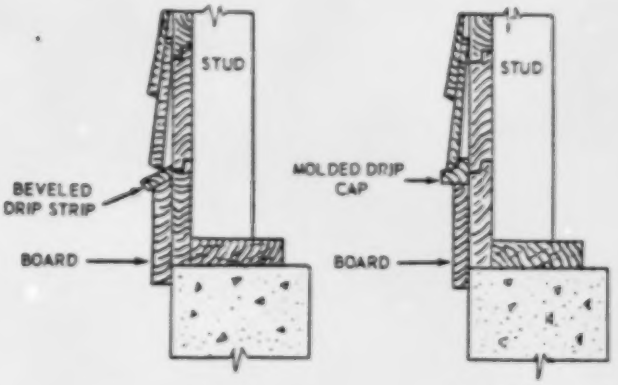

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Figure 12-12.—Common types of water table.

In general, any type of assembled water table should be flashed with metal at the drip cap. There should be a quirk (curve) provided in the underside of the drip cap to prevent water from working into the joints of the assembled water table and causing decay.

CORNER COVERING

The outside corners of a wooden frame structure can be finished in several ways. Siding boards can be miter-joined at the corners. Shingles can be edge-lapped alternately, first from one side, then from the other. Ends of siding boards can be butted and the corner then covered with a metal cap. A type of corner finish which can be used with almost any kind of outside-wall covering is called a CORNER BOARD. This corner board can be applied to